REVISED 5-7-87 Cable 2293287-503 SHUTTLE COTY DWG NO. FMEA NO. W 4.4.1 I SSUEO CRITICAL ITEMS LIST TO-14-86 2/18 SHEET CRITICALITY FATLURE MODE AND FAILURE EFFECT RATIONALE FOR ACCEPTANCE CAUSE ON END ITEM DESIGN FEATURES Loss of sync CMD Positive (TVC OFF) No Video No PJU Cantrol The W4 PTU cable is a 44-inch long, 25-wire assembly terminated by 37 pln connectors at Open/Short to 6NO. Morst Case: each end. The video and sync/com wires are shielded Iwinax shielded and twisted pairs toss of PTO control of \$24 wire. The cable connects the TVC and PTB. Connector types KUGGEL4M355N16 have been selected: prevents RMS stowage. The cable design is taken from the successfully flown Apollo program. The design is a cable-connector assembly in which the wire terminations are protected from excessive flexture at the joint between the wire and the connector terminal. The load concentration is moved away from the conductor connection and distributed axially along the length of the conductors encapsulated in a potted-taper profile. This technique also protects the assembly from dirt and entrapped moisture which could cause problems in space. The cable and its components meet the applicable requirements of NASA, Military and RCA specifications. These requirements include: General/Mechanical/Electrical Features Design and Construction Materials Terminal Solderability Environmenta) **Dualification** Marking and Serialization Traceability and Bocumentation

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FMEA NO. W 4.4.   SHUTTLE CCTV CRITECAL ITEMS LIST   DNG NO. 2293287-503   ISSUED T0-14-86   SHEET   Z DF   5    FATCURE MIDE AND CAUSE ON FAILURE EFFECT ON FIND ITEM BATIONALE FOR ACCEPTANCE    Loss of sync CHD Positive (TVC OFF) No Video Ro PTU Control				1.817
ONE FRO ITEM  The Video for Sync CMD Positive (TVC OFF)  The Video for PTV Control prevents RMS stowage.  Horst Case: Loss of PTV control prevents RMS stowage.  Horst Case: Loss of PTV control prevents RMS stowage.  ACCEPTANCE TEST  The cable acceptance test consists of an ohometer check to assure that each wire connection is present and intact. Results are recorded on data sheets.  OffickTionAl TEST  The following tests verify that CCTV components are operable and that the commands from the RMS (A7A1) panel switch, through the RCU, through the sync lines to the Camera/PTU, to the Camera/PTU command decoder are proper. The tests also verify the camera's ability to produce video and time monitor's ability to display video. A similar test verifies the MDN command path.  Pre-Launch on Orbiter Test/In-Flight Test  1. Power CCTV System. 2. So lect a monitor via the PMS panel, as destination and the camera under test as source. 3. Send "Camera Power On" command from PMS panel. 4. Select "External Sync" on monitor. 5. Observe video and signified on sonitor. If video on monitor is synchronized (i.e., stable rester), then this indicates that the camera is receiving composite sync from the RCU and that the camera is receiving composite sync from the RCU and that the camera is receiving composite sync from the RCU and that the camera is receiving composite sync from the RCU and that the camera is producing synchronized video composite sync from the RCU and that the camera is producing synchronized video composite sync from the RCU and that the camera is producing synchronized video composite sync from the RCU sternal Sync or monitor.  Send Pan, Titt, Focus, Zoon, ALC and Gamma commands and visually (either via the monitor or structure) and the camera is producing synchronized video composite sync from the RCU sternal Sync or monitor.  Send Pan, Titt, Focus, Zoon, ALC and Gamma commands and visually (either via the monitor or structure) and the camera is producing synchronized video.				[ SSUE 0   T(1-14-86
Open/Short to GND.  Horst Case: Loss of PTU control prevents RMS stowage.  ACCEPTANCE TEST The cable acceptance test consists of an ohometer check to assure that each wire connection is present and intact. Results are recorded on data sheets.  OFERATIONAL TEST The following tests verify that CCTV components are operable and that the commands from the PMS (ATAI) pane) switch, through the RCU, through the sync lines to the Camera/PTU, to the Camera/PTU command decoder are proper. The tests also verify the camera's ability to produce video, the USUs ability to produce video and the WSUs ability to produce video and the monitor's ability to obtain the pre-Launch on Orbiter Test/in-Flight Test  1. Power DCTV System. 2. Solect a nonitor via the PMS panel, as destination and the camera under test as source. 3. Send "Camera Power On" command from PMS panel. 4. Select "External Space" on monitor. 5. Observe video displayed on monitor. If video on monitor is synchronized (i.e., stable raster), then this indicates that the camera is receiving composite sync from the RCU and that the camera is producing synchronized video. 6. Send Pan, Tilt, Focus, Zoon, Alc and Gama commands and visually (either via the monitor or direct observation) verify proper generation. 7. Select Dumlink as destination and camera under test as source. 8. Send "Camera Power Off" command via PMS panel. 9. Send "Camera Power Off" command via PMS panel. 10. Repeat Steps as through 9 sexept isses commands via the MDM command and the source. 10. Repeat Steps as through 9 sexept isses commands via the MDM command and the monitor of a downlink. 10. Repeat Steps as through 9 sexept isses commands via the MDM command and the monitor of a stronger power off" command via PMS panel. 10. Repeat Steps as through 9 sexept isses commands via the MDM command and the monitor of such via the MDM commands and visually RES panel. 10. Repeat Steps as through 9 sexept isses commands via the MDM command and via the MDM command and via the MDM command and visually RES panel.		FAILURE EFFECT ON END ITEM	HATTOMALE FOR ACCEPTAN	CE
	Loss of sync CMD Positive (TVC OFF) Open/Short to GND.	No PTU Control  Horst Case: Loss of PTU control	Qualified by 1.) similarity to previous successful sy qualification tests of CCTV LRUS.  ACCEPTANCE TEST  The cable acceptance test consists of an ohmmeter che connection is present and intact. Results are record OPERATIONAL TEST  The following tests verify that CCTV components are of the PHS (A7A1) panel switch, through the RCU, through to the Camera/PTU command decoder are proper. The teability to produce video, the VSU's ability to route display video. A similar test verifies the HDN command Pre-Launch on Orbiter Test/In-Flight Test  1. Power CCTV System. 2. Solect a monitor via the PHS panel, as destination source. 3. Send "Camera Power On" command from PHS panel. 4. Select "External Sync" on monitor. 5. Observe video displayed on monitor. If video on stable raster), then this indicates that the camera from the RCU and that the camera is producing sy 6. Send Pan, Tilt, Focus, Zoom, ALC and Gamma comma monitor or direct observation) verify proper ope 7. Select Dumlink as destination and camera under 8. Observe video routed to downlink. 9. Send "Camera Power Off" command via PHS padel. 10. Repeat Steps 3 through 9 except issue commands v	perable and that the commands from the sync lines to the Camera/PTU. ests also verify the camera's video and the monitor's ability to and path.  In monitor is synchronized (i.e., era is receiving composite sync methodized video, and sand visually (either via the cration, test as source.

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Open/Short to GAD.		SHUTTLE COTY CRITICAL TIENS LIST	UNIT CASE BMG NO. 2293287-503 ISSUED 10-14-86 SHEET 3 OF 5	
Loss of sync CMD Positive (TNC OFF) NAME OF A STATE OF	FAILURE EFFECT ON END ITEM	RATIONALE FOR ACCEPTANCE		
	o Video to PNI Control torst Case: toss of PTU control trevents RMS stomage.	Procurement Control - Wire, connectors, solder, etc. ar and suppliers which meet the requirements set forth in Plan Mork Statement (WS-2593176).  Incoming Inspection & Storage - Incoming Quality inspectmaterials and parts. Results are recorded by lot and recorderials and parts. Results are recorded by lot and recorderials controlled Stores and retained under specified fabrication is required. Non-conforming materials are (MRB) disposition. (PAI-307, PAI 19C-53).  Assembly & Test - Prior to the start of assembly, all it by stack room personnel as the items are accumulated to verified again by the operator who assembles the kit by as-built-parts-list (ABPL).  Specific instructions are given in assembly drawing not called out in the Fabrication Procedure and Record (FPR Process Standard crimping flight connector contacts, 22 splicing of standard interconnecting whre using Raychem Process Standard marking of parts or assemblies with a paterial and test procedure (IP-A1-2293287). Quality at the completion of key operations.  Preparation for Shipment - When fabrication and test is packaged according to 2280/46, Process Standard for Pachall related documentation including assembly drawings, is gathered and held in a documentation folder assigned assembly. This folder is retained for reference.	tions are made on all received retained in file by drawing and Accepted items are delivered to conditions until cable held for Material Neview Board items are verified to be correct form a kit. The Items are checking against the case and applicable documents (2-2293287). These are 2280800 - 280801 - Process Standard in-line in solder sleeves, 2280876 - potting and DCAS Inspections are performed accomplete, the cable assembly is chaging and Handling Guidelines. Parts List, ABPL, Test Data, etc.	

REVISED 5-7-87 ONE NO. Cable 2293287-503 FMEA NO. N 4.4.1 SHUTTLE CCTV CRITICAL ITEMS LIST 1D-14-86 ESSUED SHEET CRITICALITY 2/4R FATEURETEFFECT ON END 1TEM FAILURE MODE AND RATIONALE FOR ACCEPTANCE CAUSE No Video No PIU Cantrol Loss of sync CMD Positive (TVC OFF) FALLURE HISTORY Open/Short to GNO. There have been no reported failures during #CA testing, pre-flight or flight. Worst Case: Loss of PTII control prevents RMS stowage.

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FMEA NO. W 4.4.1		SMUTTLE CCTV CRITICAL IYENS LIST	DNTT Cable DWG WO. 2293287-503 15SUED T0-T4-96 SHEET 5 OF 5	
FATEURE MODE AND CAUSE	FATEURE EFFECT ON END TITEM	RATIONALE FOR ACCEPTANCE		
oss of sync CMD Positive (TVC OFF) )pan/Short to GNO.	No Video No PTU Control Worst Case: Loss of PTU control prevents RMS stowage.	DERATIONAL EFFECTS  Loss of ability to position the Elbow camera. Possible elbow camera physically interferes with a payload. If payload hay door cannot be closed. Loss of craw and verifications  Perform EVA to reposition the elbow camera, use RMS mot jettison the RMS.  CREW TRAINING  Crew should be trained in contingency EVA and RMS operated the should be trained in contingency EVA and RMS operated the contingency EVA and RMS operated the camera for any flight where the justerfere with each other (for any pan or tilt angle), not change the camera position until the interfering page.	inability to stow the RMS if the RMS cannot he stowed the port wicle.  Ion to reposition the camera, or stimus procedures,  ayload and the elbow camera can lf the camera must be flown do	